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ABSTRACT

In fiscal years 1978 and 1979 the Des Moines Title I math program served approximately 1100 students in 23 elementary schools. The program which used supplementary small group instruction for students in grades 2-6 who were performing below expected levels, had five components: (1) a management system guide; (2) individual student educational plan forms; (3) two resource books, one containing teaching strategies, the other keying commercial learning materials to the program's learning objectives; (4) two parent communication guides, one for parent use and one for teacher use; and (5) inservice materials. In FY 1978 and FY 1979 all the program's objectives were met, and the average gains for both fiscal years were greater than the gains for all other districts in Iowa. The continued successful results of the program, and the fact that its five components (developed for use in a system with diverse organizational settings and a variety of basal texts) are readily exportable, suggests that the program could be widely generalizable to educationally disadvantaged students in other school districts. It has, in fact, already been replicated in a number of other districts. To support the above points, the report presents information on the program's instructional and administrative sides, student selection methods, parent involvement, inservice activities, and replication. Evidence of the program's effectiveness is also presented. (CMG)

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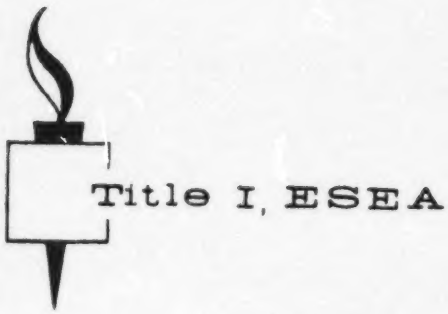

Title I Compensatory Mathematics Program

Submitted To:

Joint Dissemination Review Panel
(N.I.E. and U.S.O.E.)

April 11, 1980

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UD023 309

JOINT DISSEMINATION REVIEW PANEL SUBMISSION
Des Moines, Iowa

Program Area: Title I Mathematics, Grades 2-6

Location: Des Moines Public Schools
1800 Grand Avenue
Des Moines, IA 50307
Phone: (515) 284-7731

Program Administrators: Dr. Dwight M. Davis, Superintendent of Schools 1965-1980
Dr. William A. Anderson, Superintendent of Schools 1980-
Sharon J. Castelda, Title I Coordinator
Kathleen Bullington, Title I Mathematics Coordinator

Program Start Date: September, 1972
Submittal Data FY 1978 and FY 1979

Source and Level of Funding: Title I Allocations

	Total Allocation	Math Component	Per Pupil Cost
FY 78	$1,346,202	$344,136	$443.48
FY 79	$1,768,692	$453,471	$406.34

Title I Attendance Centers:

FY 78	FY 79
22 Elementary Buildings	23 Elementary Buildings
18 Public	18 Public
4 Non-public	5 Non-public
776 Students	1,116 Students

Title I Staff

FY 78	FY 79
1 Title I Coordinaor	1 Title I Coordinator
1 Math Coordinator	1 Math Coordinator
20 FTE Teachers	25.25 FTE Teachers
.25 Program Evaluator	.25 Program Evaluator
.15 Assistant Evaluator	.15 Assistant Evaluator
.5 Secretary	.5 Secretary

Community Overview

Des Moines, Iowa has a population of approximately 200,000 within its corporate limits of 64.13 square miles. It is the capitol and largest city in the state. Des Moines is the industrial, commercial, governmental, insurance and financial center of one of the nation's greatest food producing states. The metropolitan area which includes both Polk and Warren counties has an estimated population of 328,400.

There are concentrations of low income families within the city as well as areas where economic deprivation is non-existent. Low income students comprised 28.5 percent of the district enrollment in FY 1978 and FY 1979. Individual buildings ranged from 2.18% to 92.8% in FY 1978 and 3.84% to 89.04% in FY 1979, evidenced by the free and/or reduced price lunch data on file in the Des Moines Public School District. These data and school enrollment figures were used to designate the school attendance areas eligible for Title I services.

There are 49 public and 15 non-public elementary schools within the corporate limits of Des Moines. Enrollment consisted of 22,058 students in FY 1978 and 20,767 in FY 1979. Of these approximately 14.5% are minority students. Table 1 presents the racial makeup for each of the two years.

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TABLE 1

RACIAL COMPOSITION OF DES MOINES SCHOOL DISTRICT

Fiscal Year	White not of Hispanic Origin	Black not of Hispanic Origin	Hispanic (Latino)	Asian or Pacific Islander	Amer. Ind. or Alaskan Native	Not Identified	Total Minority Enrollment
1978	85.57	9.86	1.92	1.38	0.32	0.95	13.48
1979	84.10	10.60	2.00	1.80	0.40	1.00	14.90

Elementary schools in the Des Moines public school system are organized in a variety of patterns: (1) types of buildings-open space, traditional, self-contained; (2) grade levels K-6, K-3, K, 4-6; (3) instruction-self-contained, multi-level units, departmentalized, individualized. The Title I mathematics program operates in each of these settings.

Project Description Instruction

During the 1972-73 school year the Iowa Tests of Basic Skills revealed that large numbers of students in schools located in areas with high concentrations of low income were not achieving mathematics skills expected for students of their age. Therefore, the Des Moines public schools implemented a remedial program with a goal to increase the level of mathematic achievement of identified students. The program was funded under the Title I, ESEA legislation, an act of Congress providing funds to local agencies for programs for educationally deprived children. The traditonal classroom approach was not meeting the needs of these students; therefore, a different, more individualized approach was indicated. Program designers believed that students who are eligible for Title I service can learn and that maximum growth results from identification of students' needs followed by instruction targeted to those needs. Piaget's research indicated that elementary school students are not yet capable of reasoning hypothetically and hence many may fail under traditional rote practice methods but that they are able to work on a logical plane if they have concrete materials which they can manipulate to test ideas. Teachers need to be highly skilled in use of questioning techniques to diagnose students' needs and guide their thinking for discovery of mathematical concepts. Program designers also believed in parent involvement as an essential component. As the program was developed and modified the program emerged as supplementary small group mathematics instruction provided for students in grades 2-6 who were performing below the level normally expected of students of similar age or grade placement. After reviewing district trends project administrators established the following major objective: participating students in grades 2-6 will demonstrate an average gain by grade of at least 7.0 NCEs.

The program was designed to supplement the district's curriculum with specialized small group instruction. The Des Moines K-6 Mathematics Objectives are used to provide coordination of the supplementary instruction of the Title I teachers with the basic instruction provided by the classroom teachers. The K-6 set of objectives (which includes a suggested teaching order based on a heirarchy of skills) and a set of criterion-referenced tests based on the objectives were written by the district's Mathematics Supervisor and committees of Title I and classroom teachers. The objectives are classified in ten teaching strands and stated in behavioral terms.

All students in the Des Moines district receive direct math instruction from the classroom teachers who use basal textbook materials. Seven basal mathematics series are available for use in regular classrooms; Scott Foresman, Houghton-Mifflin, Ginn IMS, Silver Burdett, Addison Wesley, Heath and Ginn. Individual school staffs choose one of the seven basal texts for classroom instruction. Two schools in the district use the CIMS computerized instruction management system.

When a Title I identified student experiences difficulty with regular classroom lessons, the Title I teacher evaluates the student's achievement on underlying skills, then remediates the weaknesses. Title I teachers reinforce the concepts which are taught by classroom teachers, but they use different materials. The classroom teachers use textbook materials that are representational and abstract in nature. Instructional materials used by Title I teachers are varied; most are concrete materials used in the manipulative approach to concept development suggested by the research of Piaget. Many teaching materials have been designed by Title I teachers, then produced by them at the district's curriculum service center.

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Student Selection

Students are selected for Title I participation based on their performance on the district's Mathematics Test for Performance Objectives; those who score below identified cut-off scores which have been set to identify the lowest 40% of the district's students are eligible for service. In order to prevent later and more serious mathematics disabilities, selection of primary grade students is given higher priority. However, because of the wide variation in maturation levels of first grade children, identification of difficulties in understanding math concepts is difficult. Therefore, selections are made according to the following grade level priorities: students in grade 2, followed by those in grades 3, 4, 1, 5 and 6. At each grade level students are ranked and selected in order of need by scores on the Mathematics Test for Performance Objectives.

Students are retested annually on the Mathematics Test for Performance Objectives, and the selection process reoccurs each year. A student may be selected for second year service using the same procedure that was used when he/she was selected initially: e.g., his current test score ranks him/her among those in greatest need. Students would not qualify for service if their scores were above the cut-off criteria. During the year teachers administer the Mathematics Test for Performance Objectives to students new to the district, and these students become eligible for the mathematics program on the basis of these test scores.

Organization for Instruction

Each Title I teacher serves a maximum of 40 students daily. Group size varies from 1 to 6 and may not exceed 6 per instructional period. The Title I teacher has the option of working in an assigned space either in or outside of the regular classroom.

Title I students receive 25-30 minutes of supplementary mathematics instruction daily. More than 90% of the students receive this supplementary instruction during their regular mathematics period, and in compliance with the Title I regulations, they also receive direct mathematics instruction from the classroom teacher for an amount of time equivalent to at least half the regular mathematics period. If scheduling requires students to be served by the mathematics program during some period other than their math period, the students are taken from a different subject period each semester in order not to sacrifice other areas of their curriculum.

Cooperation and coordination between the Title I teachers and classroom teachers is an essential feature of the program. Title I teachers plan weekly with each involved classroom mathematics teachers for purposes of diagnosing, prescribing and implementing instruction, and evaluating the progress of Title I math students.

During these planning sessions, the teachers jointly prepare individual educational plans for Title I students using two Des Moines Title I mathematics publications: Educational Plan Title I Mathematics and Student Record Folder. The Educational Plan Title I Mathematics is a management system guide which contains the Des Moines K-6 Mathematics Objectives, a hairarchy of skills and criterion-referenced test items. Placement inventories enable teachers to find instructional levels for students new to the program. The Student Record Folder contains pupil profile charts with the K-6 objectives arranged in the suggested teaching order. This folder is used both as a record and as an ongoing individual educational plan. In it teachers identify and mark those skills and concepts in which the student is deficient and also mark those concepts which they plan to teach to the student. They record dates when concepts are introduced and dates when the concepts are mastered by the student. This record folder is part of the student's records that follow him/her if he/she moves from one school to another.

The teachers also jointly select strategies for teaching students which are appropriate for the students' individual learning styles. Title I teachers use strategies from the Des Moines Title I mathematics publication Strategies and Materials. This publication is a recource book which was written by a committee of Title I teachers, the Title I mathematics coordinator and the district

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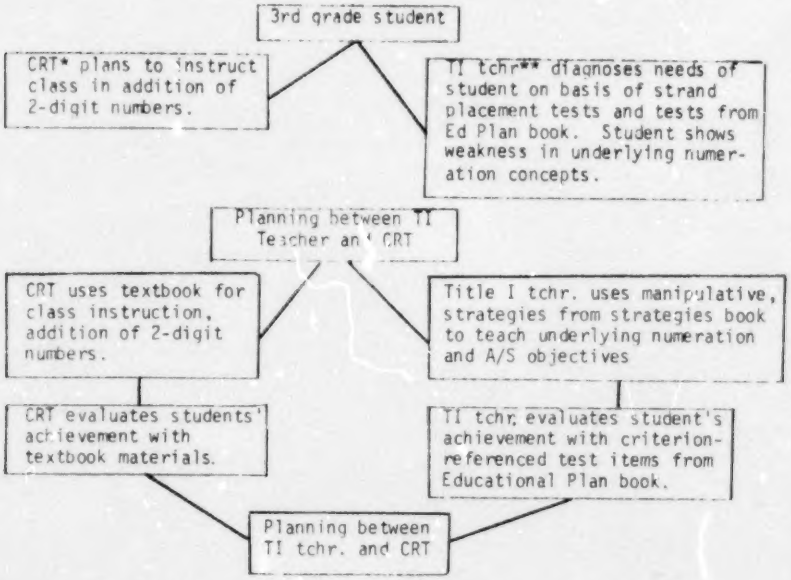
mathematics supervisor. This book describes teaching strategies for the addition, subtraction, multiplication, division, rational number, and decimal fraction strands. The strategies which are based on the theories of Piaget use the manipulative approach to the development of algorithms through understanding of numeration concepts. Appropriate uses of manipulative materials (e.g., metric block, Unifix cubes, and teacher-made materials) are described in the manual. Questioning techniques that use a discovery or inductive reasoning approach are stressed. Title I teachers also refer to a second Des Moines Title I mathematics handbook, Management System for Mathematics Materials, which contains lists of commercial materials available to teachers in the project. In this handbook materials are keyed to learning obejctives for which their use is appropriate.

Title I teachers and classroom teachers use different strategies and materials to teach the same concepts to students. They are successful in coordinating two lines of instruction because they plan weekly and because the Title I teachers provide guidance to the classroom teachers through the program's inservice component. In that component, Title I teachers share teaching ideas with classroom teachers. Thus, both teachers present consistent instruction.

The relationship between the classroom teacher's mathematics program for an individual student and the Title I mathematics teacher's program is illustrated in Chart 1.

Chart 1

Example of sequence in planning for an individual student


3rd grade student
CRT* plans to instruct class in addition of 2-digit numbers.
TI tchr** diagnoses needs of student on basis of strand placement tests and tests from Ed Plan book. Student shows weakness in underlying numeration concepts.
Planning between TI Teacher and CRT
CRT uses textbook for class instruction, addition of 2-digit numbers.
Title I tchr. uses manipulative, strategies from strategies book to teach underlying numeration and A/S objectives
CRT evaluates students' achievement with textbook materials.
TI tchr evaluates student's achievement with criterion-referenced test items from Educational Plan book.
Planning between TI tchr. and CRT

*CRT-classroom teacher
**TI tchr.-Title I teacher

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Parent Involvement

Parent communication is an extremely important feature of the Title I mathematics program. During the school year, Title I teachers are required to have extensive personal contact with the parents of students through a program of home visits, school conferences, telephone calls, coffees and parent-child make-and-take sessions. To achieve this personal contact, Title I teachers are released from their instructional duties one-half day a week throughout the year. During FY 78 and FY 79, Title I mathematics teachers visited in the homes of approximately 70% of their students. School conferences, telephone calls, coffees, and parent-child make-and-take sessions were made with an additional 15% of the students' parents.

Two Title I handbooks about parent involvement are used by Title I teachers. The parent handbook, Home Is For Helping, offers suggestions parents can use to turn daily tasks into opportunities for enhancing mathematics skills at home with their children. This booklet is given to all parents during home visits or during school conferences. The Teacher Guide to Parent Communication provides guidance to Title I teachers for effective parent communication. It outlines practical suggestions for making home visits, includes a variety of alternative ideas for involving parents in the Title I mathematics program, and samples of letters, invitations, student contracts, and achievement certificates.

The District Parent Advisory Council (PAC) meets seven times a year. These evening meetings are held at a centrally located Title I attendance center. The district PAC consists of parent representatives from each of the Title I schools. The Title I mathematics teachers are encouraged to attend the meetings, and they are asked to show ideas that parents can use at home with their children to reinforce mathematics skills. Parent-teacher conferences are held once each semester in the district. Parents are invited to confer with Title I mathematics teachers at the time of their conferences with the regular classroom teachers.

Inservice

Des Moines teachers, like most certified elementary classroom teachers, have limited formal preparation in teaching of mathematics. Therefore, the district's mathematics supervisor and the Title I mathematics coordinator have worked with Title I mathematics teachers to develop suggested teaching strategies. These strategies which are written in the Strategies and Materials handbook are presented at inservice meetings. Teachers who have attended professional meetings share ideas with other Title I teachers. The inservice component is an important part of the program, as it provides consistency in the mathematics program and causes the teachers to grow professionally.

Inservice activities occur at regular intervals throughout the year. During the fall orientation week or during the first week of school Title I teachers are required to attend a minimum of one day of inservice conducted by the Title I mathematics coordinator to discuss the Title I program for the coming year, to share teaching strategies, and to demonstrate new materials. Title I teachers new to the program attend an additional one-half day of inservice to learn how to use the materials that form the core of the program. Throughout the year, monthly or bimonthly meetings are planned for all Title I teachers or small groups of Title I teachers who have common interests or needs. A committee of Title I teachers, the Title I mathematics coordinator, and the district mathematics supervisor plans these meetings.

Piaget's philosophy forms the basis for the teaching of Title I mathematics program. His research indicated that elementary school students are not yet capable of reasoning hypothetically and hence may fail under traditional rote practice methods but that they are able to work on a logical plane if they have concrete materials which they can manipulate to test ideas. His theories and suggested teaching strategies which use questioning techniques and concrete materials are taught by the Title I mathematics coordinator in the course How Children Learn Mathematics which is offered to teachers through the district's staff development courses. Upon completion of staff development courses, Title I or regular classroom teachers earn credit toward renewal of their teaching certificates and credit for advancement on the district's salary schedule. The textbook for the course

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How children Learn Mathematics, second edition, by Richard Copeland, MacMillan and Co., 197[illegible] can be ordered from the publisher. Study guides for use with this book, Study Guides for How Children Learn Mathematics which were written by the district's mathematics supervisor are an important part of the Title I mathematics inservice component.

Title I mathematics staff also serve as resources for the regular classroom teachers. They have prepared inservice activities about teaching strategies. These workshops have been presented to all regular classroom teachers of mathematics in all Title I buildings. Six booklets which were written by Title I teachers on various aspects of teaching mathematics to Title I students are used for these workshops. Sets of cards and transparency materials are described in the booklets so the materials can be produced by other teachers. Titles of the books are: Numbers, Numerals, Numeration; Math Starring the Dominoes; Think More About Thinking; Help Wanted, Inquire Within-Estimation; Seeing Through Fractions; and Basic Facts of Life.

These three types of inservice activities, (1) Title I inservice; (2) staff development courses and, (3) resource help to classroom teachers of Title I students, enable effective teaching strategies to be disseminated to all teachers of Title I mathematics students.

Replication

The Des Moines Title I mathematics program can be replicated easily using the five components of the program. These components are: (1) the management system guide, Educational Plan Title I Mathematics, which contains a brief description of the program, the K-6 teaching objectives, and test items for each objective; (2) the individual educational plan form, the Student Record Folder; (3) two resource books, Strategies and Materials which contains teaching strategies and Management System for Mathematics Materials which keys commercial learning materials to learning objectives; (4) two parent communication handbooks, Home is For Helping which is designed for parent use and the Teacher Guide to Parent Communication which is designed for teacher use; and (5) inservice materials, Study Guide for How Children Learn Mathematics, and the six booklets, Numbers, Numerals, Numeration; Math Starring the Dominoes; Think More About Thinking; Help Wanted, Inquire Within-Estimation; Seeing Through Fractions; and Basic Facts of Life.

Components of the Des Moines Title I mathematics program have been disseminated in a variety of ways. Title I mathematics teachers have presented programs on the teaching strategies at the district's annual inservice day for all classroom teachers and at the annual statewide meeting of the Iowa Council of Teachers of Mathematics. The Des Moines Title I mathematics program has received support from the state Title I office; that agency has invited the Des Moines Title I teachers, principals and coordinator to present the Des Moines program at statewide Title I conferences in Iowa and at the Region VII conference in Kanss City, Missouri for participants of Title I Regional Conference coming from states of Nebraska, Kansas, Missouri and Iowa. The state Title I office has also sent teachers and administrators from other Iowa districts on visitations to the Des Moines program. The Title I math coordinator was invited to present a program to a two-county meeting in Missouri. As a result of these presentations, school districts in Iowa and in other states of Region VII have purchased components of the Des Moines Title I mathematics program. These users have indicated that the Des Moines program is easy to adopt as written or is easily modified to meet individual district needs. The five components provide a program that is readily exportable because it has been developed for use in a system with diverse organizational settings and a variety of basal texts.

To provide dissemination of information of the Des Moines Title I program the staff developed two (30 min.) sound slide presentations. These presentations are used for Parent Advisory Councils, P.T.A.s, individual building staff meetings, community meetings and special presentations.

Estimated cost of replicating the Title I mathematics program appears in Chart 2.

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Chart 2

Cost of Replication With One Teacher Serving Forty Students

	Installation (Non-recurring Costs)	Subsequent Years (Recurring costs)
Personnel-1 Math teacher	$15,000*	$15,000*
Personnel Training	Staff training is done during released time	
Facilities	No special needs	
Equipment & Materials	475	125
Student Record Folders		
Metric Blocks or Manipulatives		
Consumable Materials		
Metropolitan Achievement Tests (for evaluation)	130	130
Other costs-specify:		
Auto mileage for home visits @ 18¢ per mile	20	20
Total	$15,625	$15,275

*Cost for personnel will vary according to district salary schedule.

Administration of Program

In order to implement the Title I math program in Des Moines Title I teachers (approximately 25) are assigned to identified schools on the basis of educational need and funding limitations. Each full time Title I teacher serves a maximum of 40 students daily.

District psychologists and social workers provide support services to Title I students. Psychologists assist in testing, diagnosing, and counseling in order to meet individual needs. Social workers counsel Title I students and consult with parents and school staff to coordinate efforts to deal with students' problems.

The staff positions necessary to implement the Title I math program in a district the size of the Des Moines public schools appear in Chart 3.

Chart 3

Staff Positions In Des Moines' Title I Mathematics Project

Position	Responsibility
Title I Coordinator	Responsible for project implementation
Title I Counsultant	Responsible for assisting coordinator to implement project goals
*Title I Math Coordinator	Coordinates the activities of the Title I mathematics program as it relates to the curriculum of the Title I schools.
*Title I Mathematics Teacher	Responsible for diagnosing skill deficiencies and providing supplemental individualized mathematics instruction for Title I identified students
*Program Evaluator	Evaluates the Title I project objectives
Assistant Evaluator	Assists in the evaluation of the Title I project objectives
*Secretary	Provides secretarial services to the mathematics coordinator

*Denotes the staff positions which are the core for the mathematics program implementation. These functions could be combined into one position or partically assigned to a principal or other administrator. The other positions are required in a large system due to the number of staff and students involved in the math program and the coordination with the other Title I programs within the district.

The Title I mathematics program has received continuous support from district administrators. The Executive Director of Elementary Education conducts meetings attended by Title I building principals, the Title I mathematics coordinator, and the district's supervisor of mathematics to plan the development and implementation of the Title I mathematics program. The district's supervisor of mathematics meets weekly with the Title I mathematics coordinator to plan for implementation of

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the Title I mathematics program. The district's Supervisor of mathematics meets weekly with the Title I mathematics coordinator to plan for implementation of recommended teaching strategies and plan the coordination of the Title I mathematics program with the district's mathematics program. Building administrators provide released time for Title I teachers 1/2 day per week for achieving inservice training and parent involvement objectives.

Sustaining Gains and Impact

This effort to upgrade instruction has resulted in improvement in mathematics achievement by Des Moines school students, and school administrators have applauded the program publicly. An article in the Des Moines Register in October, 1979, stated that "Des Moines public school students have shown some marked improvements in their performance on mathematics tests during the past several years,...." The article stated that the districtwide improvement occurred for the second year in grades kindergarten through six and quoted the district's mathematics supervisor as being particularly pleased about "exceptional" gains made by Title I students.

Evidence of Effectiveness

The norm-referenced model was used by the Des Moines School District to evaluate its Title I mathematics program. The norm-referenced model determines a measure of cognitive gain (program effect) for a program by calculating the difference between the observed post treatment performance and the expected no-treatment performance of the students in that program. In this model it is assumed that, without a compensatory treatment (Title I), the status of the group at posttest time would be the same as it was at pretest time. Thus, the group's pretest percentile on a nationally standardized test becomes the expected no-treatment posttest performance. The observed post-treatment performance is the percentile rank corresponding to the group's mean posttest score. Percentile scores are then converted to the USOE common metric, Normal Curve Equivalent (NCE)*, which are normalized standard scores with a population mean of 50 and a standard deviation of 21.06. If the group's posttest status is higher than the no-treatment expectation, the assumption is made that the improvement resulted from participation in the Title I project. The pretest was not used to select program participants, both the pretest and posttest were administered within two weeks of the emperical normative dates for the standardized test, the appropriate levels of the tests were administered to avoid floor and ceiling effects. Since the model was designed to accommodate data from programs in grades two on, the first grade data were not included in the analysis for program effectiveness.

The Mathematics Battery of the Metropolitan Achievement Tests, 1970 and 1978 editions were used to evaluate the Des Moines Title I program during the 1977-78 and 1978-79 school years respectively. The change in editions was made to take advantage of more current norms.

To establish validity, test objectives of both editions were reviewed by the program coordinator and program evaluator to assure that the objectives corresponded to those used in the mathematics program. The publisher's technical manuals were examined for reliability estimates. The split half and KR 20 estimates of internal reliability for the 1970 edition mathematics tests were 0.93 or more for all levels (Prescott, 1973). The KR 20 estimates for the 1978 edition were 0.86 to 0.90 (Psychological Corporation, 1978).

The pre and posttest levels were administered as recommended by the test publishers (see Table 2). The test publisher's recommended levels are as follows: Primary I, middle of first grade to middle of second grade; Primary II, middle to second grade to middle of third grade; Elementary, middle of third grade to end of fourth grade; Intermediate, beginning of fifth grade to end of sixth grade.

*NCEs form an equal interval scale with a mean of 50 and a standard deviation of 21.06 and math the percentile scale at 1, 50 and 99. NCEs can be legitimately used in arithmetic computations because the length of the interval between any two adjacent scores on the scale is equal to the interval between every other adjacent pair of scores.

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TABLE 2

Levels Used for the Pre and Posttesting by Grade

Grade	2	3	4	5	6
Pretest Level	Primary I	Primary II	Elementary	Intermediate	Intermediate
Posttest Level	Primary II	Elementary	Elementary	Intermediate	Intermediate

Scores of the students attending the district's two Follow Through schools were excluded from the analysis to prevent any possible contamination of the Title I results. Of the twenty remaining schools only students with both a pre and posttest score were included in the anaiysis.

The data were examined for floor and ceiling effects. According to Talmadge and Wood (1976), the difference between the mean and median raw scores for each testing and grade should be less than one-third of the respective standard deviations to ensure data free of floor and ceiling effects. The assumption is made that if ceiling or floor effects exist there would be a skewing of the score distributions. The existence of these efforts would be indicated by a difference between the mean and median of at least one-third of a standard deviation.

The differences between the mean and median raw scores by grade and year is reported. These differences in the median and mean raw scores are less than the least standard deviation: FY 78: 7.5, FY 79: 4.5. This indicates that the data were not affected by floor and ceiling effects.

TABLE 3

Difference Between Median and Mean Raw Scores - Mathematics

		PRETEST					POSTTEST				
Year	Grades	2	3	4	5	6	2	3	4	5	6
FY 78		-0.4	-2.1	1.5	-2.0	0.0	0.4	0.5	0.4	-0.4	-0.7
FY 79		0.1	0.2	0.1	0.4	0.4	0.2	0.8	-.9	0.8	0.8

The number of students, the percentile rank equivalent to the mean NCE score, the mean NCE, and calculated t values are reported in Tables 4 and 5 for FY 1978 and FY 1979 respectively. The paired (or correlated) t-test was used to test for statistical differences between the expected no-treatment measure (pretest NCE scores) and the observed post treatment measures (posttest NCE scores). The t values are significant at a probability level less than or equal to 0.001, indicating that the differences between the expected no-treatment value and the observed post-treatment value are highly significant. Thus, it is concluded that the Title I program provided a positive treatment effect.

TABLE 4

1977-78 Mathematics Pre and Posttest Results of the M.A.T.

		PRETEST			POSTTEST					
Grade	N	Mean %ile Rank[a]	Mean NCE[b]	NCE S.D.	Mean %ile Rank	Mean NCE	NCE S.D.	NCE Gain	t	df
2	70	16	29.2	12.0	29	38.3	12.3	9.1	5.4*	69
3	123	13	25.9	13.3	29	38.5	12.1	12.1	12.0*	122
4	101	10	22.9	14.5	20	32.3	13.8	9.4	8.4*	100
5	88	12	25.5	13.4	21	32.9	13.9	7.0	5.2*	87
6	79	11	23.7	10.5	20	32.0	11.5	8.3	6.6*	78

*Probability (p) less than or equal to 0.001

[a]Percentile ranks are conversions from mean NCEs

[b]Means and standard deviation are of individual student NCE scores

TABLE 5

1978-79 Mathematics Pre and Posttest Results of the M.A.T.

		PRETEST			POSTTEST					
Grade	N	Mean %ile Rank[a]	Mean NCE[b]	NCE S.D.	Mean %ile Rank	Mean NCE	NCE S.D.	NCE Gain	t	df
2	148	13	26.7	12.7	34	41.1	14.6	14.4	13.0*	147
3	142	12	25.6	14.6	36	42.2	14.9	16.6	12.3*	141
4	177	24	34.9	14.3	44	46.7	16.8	11.8	12.3*	176
5	121	16	29.11	13.4	30	38.7	13.7	9.6	7.6*	120
6	116	18	30.3	13.5	36	42.6	14.0	12.3	12.7*	115

*Probability (p) less than or equal to 0.001

[a]Percentile ranks are conversions from mean NCEs

[b]Means and standard deviations are of individual student NCE scores

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The data analyzed so far are dealing with individual students' scores. However, with testing as with any other measurement, there is a certain amount of error involved, meaning that if we know a student's (or group of students) test score this is actually the true score plus some error term. Unfortunately, the error term is rarely known, making it impossible to determine the true score. It is possible using estimations of the standard error of measurement with a given probability to calculate intervals that "capture" the true score.

To calculate confidence intervals for the Des Moines data, the means and standard deviations in terms of NCEs, the correlation coefficients reported by the test publishers, and the proportion of the probability curve that represents 95% of the curve ($\alpha = 0.05$) were used. The observed pre and posttest means and their calculated confidence intervals are presented in Table 6. Since the reported mean scores for the pretest are not included within the interval for the posttest scores and vice versa, it is concluded that the true test scores for the pre and posttests are different.

TABLE 6

Mean and Confidence Intervals for Title I Students - Mathematics

	FY 78				FY 79			
Grade	Pretest Mean	Confidence Interval	Posttest Mean	Confidence Interval	Pretest Mean	Confidence Interval	Posttest Mean	Confidence Interval
2	29.2	(23.0,35.4)	38.3	(32.9,43.7)	26.7	(17.4,36.0)	41.1	(38.0,44.2)
3	25.9	(20.1,31.7)	35.5	(30.3,40.2)	25.6	(15.7,35.5)	42.2	(33.0,51.4)
4	22.9	(17.2,28.6)	32.3	(26.9,37.7)	34.9	(26.0,43.8)	46.7	(36.3,57.1)
5	25.5	(19.6,31.4)	32.9	(26.8,39.0)	29.1	(20.4,37.8)	38.7	(30.6,40.8)
6	23.7	(19.1,28.3)	32.0	(27.0,37.0)	30.8	(22.4,39.2)	42.6	(33.9,51.3)

From Tables 4 and 5 it can be seen that all of the NCE gains were greater than seven, indicating that the objectives were met. Additional evidence of educational importance can be indicated by comparing the Des Moines gains with the NCE gains reported by the other Title I school districts in Iowa. Table 7 shows that the average gains for both fiscal years were greater than the gains for all of the districts in Iowa (excluding Des Moines).

TABLE 7

Comparison of Iowa and Des Moines School District Title I NCE gains for FY 78 and 79 Mathematics

	FY 78		FY 79	
Grade	Iowa Gains	Des Moines Gains	Iowa Gains	Des Moines Gains
2	3.6	19.1	6.7	14.4
3	2.2	12.6	6.1	16.6
4	6.7	9.4	8.3	11.8
5	9.2	7.0	7.1	9.6
6	8.9	8.3	7.4	12.3
Mean Gain	6.4	9.6	7.3	13.0

The continued successful results of the Des Moines Title I Mathematics program by approximately 1100 students in 23 elementary schools with a variety of organizational structures and multibasal mathematics textbook adoptions provides evidence that this compensatory mathematics project could be widely generalizable to other school districts for educationally deprived students. School districts in Iowa, Nebraska, Kansas, and Missouri have purchased components of the Des Moines Title I Mathematics program. These users have indicated that the Des Moines program is easy to adopt as written or easily modified to meet individual district needs. The five components provide a program that is readily exportable because it has been developed for use in a system with diverse organizational settings and a variety of basal tests.

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References

Prescott, G.A. Manual for Interpreting. New York: Harcourt Brace Jovanovich, 1973

Psychological Corporation. Reliability Estimates and Standard Errors of Measurement for the Survey and Instructional Tests. Special Report Number 11. New York; Harcourt Brace Jovanovich, Inc., 1978

Roberts, A.O. Cut Off Level Testing. Title I Evaluation and Reporting System, Technical Report Number 6, October, 1976.

Tallmadge, G.K., Horst, D.P. and Wood, C.T. A Practical Guide to Measuring Impact on Student Achievement. U.S. Government Printing Office, 1975.

Tallmadge, G.K., and Wood, C.T. User's Guide. Mountain View, CA; RMC Research Corporation, 1976.

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